Thermal analysis and phase diagram of the system $Li_2W_2O_7$ - $La_2W_2O_9$ on the melting behavior investigation of $LiLa(WO_4)_2$

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Disordered tetragonal (scheelite-like) alkali rare earth double tungstates, belonging to the family $ARE(WO_4)_2$ (where A = Li, Na, K and RE = La-Lu), are interesting hosts for developing tunable solid state lasers. Their variable crystalline field allows broad dopants optical absorption and emission bands. During the study of single fibers crystal growth of $Nd : LiLa(WO_4)_2$ (Nd:LLW), for laser applications, we observed some divergences concerning the melting behavior of LLW compound. To clarify the observed behavior differential thermal analysis (DTA) was performed, first for specific regions of the system Li_2O - La_2O_3 - WO_3, and later for the $Li_2W_2O_7$ - $La_2W_2O_9$ system selected on the previous study to research $LiLa(WO_4)_2$ (LLW) melting behavior. Thermal measurements were performed in a Netzsch STA Jupiter 449C equipment, and high purity compounds were used for samples preparation. The experimental construction of the phase diagram for the system x$Li_2W_2O_7$ - (1-x)$La_2W_2O_9$ confirmed that the LLW (formed in a homogeneity region of $0.48 \leq x \leq 0.52$) decomposed peritectically at 1000oC. It was also observed that rare earth doping influences the LLW melting. Growth, DTA and XRD data of LLW fibers grown under the compositions based on our phase diagram confirmed the results. The process of fiber growing was optimized with a minimum excess of $Li_2W_2O_7$.